DOCUMENT RESUME

ED 291 630 SO 018 633

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TITLE A Comparative Study of the Pre-Professional Skills Tests (PPST) Test Scores of Pre-Service Teachers at Mankato State University.
PUB DATE 87
NOTE 11p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cognitive Ability; Cognitive Measurement; Comparative Analysis; Educational Research; Intelligence; Labeling (of Persons); *Preservice Teacher Education; Sex Discrimination; *Teacher Characteristics; Teacher Education; Teacher Stereotypes; Womens Education
IDENTIFIERS *Mankato State University MN

ABSTRACT

This research study tested commonly held beliefs concerning gender differences in mental ability. People tend to believe that female pre-service teachers will score significantly higher in verbal ability (reading and writing) than male pre-service teachers, and that male pre-service teachers will score significantly higher in mathematics. The "Pre-Professional Skills Tests (PPST)" was administered to 36 females and 23 males during a 50-minute class period. The test consisted of 24 multiple-choice questions and was divided into three sections, with eight questions in each area. The study yielded these findings: (1) while verbal (reading and writing) ability of female pre-service teachers is higher than male pre-service teachers, it is not significantly greater; (2) mathematics ability of male pre-service teachers is significantly higher than that of female pre-service teachers; (3) writing ability of male pre-service teachers is significantly higher than their reading ability; and (4) mathematics ability of male pre-service teachers is significantly higher than their verbal (reading and writing) ability. The paper concludes with a word of caution concerning the limitations of this study. (NL)

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A COMPARATIVE STUDY OF THE PRE-PROFESSIONAL SKILLS TESTS (PPST) TEST SCORES OF PRE-SERVICE TEACHERS AT MANKATO STATE UNIVERSITY

by

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SO018633

A COMPARATIVE STUDY OF THE PRE-PROFESSIONAL SKILLS TESTS (PPST) TEST SCORES OF PRE-SERVICE TEACHERS AT MANKATO STATE UNIVERSITY

Richard F. Daly

Gender differences in mental ability have long interested educators even though there is still some debate about the existence of gender-linked ability differences. For example, a highly regarded analysis of such studies indicates that females and males do not differ in reading, mathematical, or other skills until adolescence. Females then develop a strong lead in verbal ability that continues through the high school and college years. Males, on the other hand, move ahead in quantitative skills and visual-spatial ability (Maccoby and Jacklin, 1974).

Indeed, these research findings have become part of the conventional wisdom of persons responsible for the conduct of teacher education programs. That is, they tend to believe: (1) The reading ability of female pre-service teachers is higher than male pre-service teachers. (2) The writing ability of female pre-service teachers is higher than male pre-service teachers. (3) The mathematics ability of male pre-service teachers is higher than female pre-service teachers.

Problem and Hypotheses

These beliefs are not without their adherents at Mankato State University, Mankato, Minnesota. However, these beliefs have not been submitted to the test of experimental evidence. Other questions, largely unanswered, are also suggested by the earlier research data: (1) Is the reading ability of female pre-service teachers higher than their mathematics ability? (2) Is the reading ability of female pre-service teachers higher than their writing ability? (3) Is the writing ability of female pre-service teachers higher

than their mathematics ability? These same questions apply to their male counterparts. Moreover, the question at issue is not whether there is a difference between or within groups, but whether or not there is a real or statistically significant difference between or within groups. Consequently, it is the purpose of this investigation to answer the general research question: Is there a real difference in the Pre-Professional Skills Tests (PPST) test scores within and between female and male pre-service teachers at Mankato State University (MSU)?

Nine null hypotheses were formulated to answer the general research question and guide the research process. Hypotheses one through six focus on differences within groups (dependent samples) while hypotheses seven through nine focus on differences between groups (independent samples). The hypotheses are as follows:

1. There is no significant difference between the PPST reading and PPST mathematics test scores of MSU female pre-service teachers.
2. There is no significant difference between the PPST reading and PPST writing test scores of MSU female pre-service teachers.
3. There is no significant difference between the PPST mathematics and PPST writing test scores of MSU female pre-service teachers.
4. There is no significant difference between the PPST reading and PPST mathematics test scores of MSU male pre-service teachers.
5. There is no significant difference between the PPST reading and PPST writing test scores of MSU male pre-service teachers.
6. There is no significant difference between the PPST writing and PPST mathematics test scores of MSU male pre-service teachers.
7. There is no significant difference between the PPST reading test scores of MSU male and female pre-service teachers.

8. There is no significant difference between the PPST mathematics test scores of MSU male and female pre-service teachers.
9. There is no significant difference between the PPST writing test scores of MSU male and female pre-service teachers.

Groups Studied and Methods of Procedure

This study involved fifty-nine pre-service teachers, thirty-six females and twenty-three males enrolled in two of the investigator's teacher education undergraduate classes at Mankato State University.

Sample written questions from the Pre-Professional Skills Tests (PPST) were administered to these students on Monday, September 21, 1987, during a fifty-minute class period. The test consisted of twenty-four multiple-choice questions and was divided into three sections, eight questions each for reading, mathematics, and writing. Approximately fifteen minutes, including the reading of instructions, was allowed for each section. The essay part of the writing section of the test was not administered to students.

The sample test questions were drawn from the Pre-Professional Skills Tests, 1987-88, Bulletin of Information (Educational Testing Service, 1987). All teacher educators in the state of Minnesota were provided with this bulletin (as well as a 1986-87 edition). This was done because effective April 4, 1988, all applicants for initial licensure as defined in Minnesota Statutes 125.03, subdivision 5, shall provide evidence of having successfully completed examinations in reading, mathematics, and writing prior to the issuance of an initial Minnesota teaching license. The Pre-Professional Skills Tests (PPST) test was selected by the Minnesota Board of Teaching as the evaluative instrument to determine initial licensure (Peatross, 1985).

As previously cited in the statement of the problem, a general research question and appropriate null hypotheses were formulated to guide the research

process. The necessary formulas and tables were followed from Hinkle's book, Basic Behavioral Statistics to test the significance between two means for dependent samples and independent samples (Hinkle, 1982). The .05 level of significance for a two-tailed test was determined to be sufficiently exacting for this investigation. However, if a given difference (critical ratio) between groups reaches or goes beyond the .01 level of significance, it will be marked highly significant. These data are presented in Table 1.

Study Findings

The first null hypothesis tested: There is no significant difference between the PPST reading and PPST mathematics test scores of MSU female pre-service teachers. As indicated in Table 1, the female reading test scores mean is 4.94 while their mathematics test scores mean is 5.58. The difference between the two means is .64 favoring their mathematics test scores. This difference yielded a critical ratio (t) of 1.83 which fails to reach the .05 level of significance for 35 degrees of freedom. Hence the difference between means must be marked as not significant.

The second null hypothesis tested: There is no significant difference between the PPST reading and PPST writing test scores of MSU female pre-service teachers. As seen in Table 1, the female reading test scores mean is 4.94; on the other hand, their writing test scores mean is 6.19. The difference between the two means is 1.25 favoring their writing test scores. This difference resulted in a critical ratio (t) of 3.57 which exceeds the .01 level of significance for 35 degrees of freedom. Thus the difference between means must be recorded as highly significant.

The third null hypothesis tested: There is no significant difference between the PPST mathematics test scores and the PPST writing test scores of MSU female pre-service teachers. As shown in Table 1, the female mathematics test scores mean is 5.58 while their writing test scores mean is 6.19.

The difference between the two means is .61 favoring their writing test scores. This difference yielded a critical ratio (t) of 1.65 which fails to reach the .05 level of significance for 35 degrees of freedom. Therefore the difference between means must be marked as not significant.

The fourth null hypothesis tested: There is no significant difference between the PPST reading and PPST mathematics test scores of MSU male pre-service teachers. As indicated in Table 1, the male reading test scores mean is 4.43; on the other hand, their mathematics test scores mean is 6.78. The difference between the two means is 2.35 favoring their mathematics test scores. This difference resulted in a critical ratio (t) of 6.71 which exceeds the .01 level of significance for 22 degrees of freedom. Hence the difference between means must be recorded as highly significant.

The fifth null hypothesis tested: There is no significant difference between the PPST reading and PPST writing test scores of MSU male pre-service teachers. As seen in Table 1, the male reading test scores mean is 4.43 while their writing test scores mean is 5.70. The difference between the two means is 1.27 favoring their writing test scores. This difference yielded a critical ratio (t) of 3.53 which exceeds the .01 level of significance for 22 degrees of freedom. Thus the difference between means must be marked as highly significant.

The sixth null hypothesis tested: There is no significant difference between the PPST writing and PPST mathematics test scores of MSU male pre-service teachers. As shown in Table 1, the male writing test scores mean is 5.70; on the other hand, their mathematics test scores mean is 6.78. The difference between the two means is 1.08 favoring their mathematics test scores. This difference resulted in a critical ratio (t) of 2.84 which exceeds the .01 level of significance for 22 degrees of freedom. Therefore, the difference between means must be recorded as highly significant.

TABLE 1. SIGNIFICANCE OF THE DIFFERENCE BETWEEN PRE-PROFESSIONAL SKILLS TESTS (PPST) TEST SCORE MEANS: READING, MATHEMATICS, AND WRITING

HYPOTHESIS NUMBER	GENDER	MENTAL ABILITY	MEAN	DIFFERENCE BETWEEN MEANS	CRITICAL RATIO(t)	LEVEL OF OF SIGNIFICANCE
						(N=36 df=35)
One	F	Reading	4.94	.64	1.83	*
	F	Mathematics	5.58			
Two	F	Reading	4.94	1.25	3.57	***
	F	Writing	6.19			
Three	F	Mathematics	5.58	.61	1.65	*
	F	Writing	6.19			
						(N=23 df=22)
Four	M	Reading	4.43	2.35	6.71	***
	M	Mathematics	6.78			
Five	M	Reading	4.43	1.27	3.53	***
	M	Writing	5.70			
Six	M	Mathematics	6.78	1.08	2.84	***
	M	Writing	5.70			
						(N=59 df=57)
Seven	F	Reading	4.94	.51	1.34	*
	M	Reading	4.43			
Eight	F	Mathematics	5.58	1.20	2.79	***
	M	Mathematics	6.78			
Nine	F	Writing	6.19	.49	1.17	*
	M	Writing	5.70			

*Not significant at .05 level of significance
**Significant at .05 level of significance
Critical Ratio (t): 2.04 for 35 df, 2.07 for 22 df, 2.01 for 57 df
***Significant at .01 level of significance
Critical Ratio (t): 2.75 for 35 df, 2.82 for 22 df, 2.68 for 57 df

The seventh null hypothesis tested: There is no significant difference between the PPST reading test scores of MSU male and female pre-service teachers. As indicated in Table 1, the male reading test scores mean is 4.43 while the female reading test scores mean is 4.94. The difference between the two means is .51 favoring the female pre-service teachers test scores. This difference yielded a critical ratio (t) of 1.34 which fails to reach the .05 level of significance for 57 degrees of freedom. Hence the difference between means must be marked as not significant.

The eighth null hypothesis tested: There is no significant difference between the PPST mathematics test scores of MSU male and female pre-service teachers. As seen in Table 1, the male mathematics test scores mean is 6.78; on the other hand, the female mathematics test scores mean is 5.58. The difference between the two means is 1.20 favoring the male pre-service teachers test scores. This difference resulted in a critical ratio (t) of 2.79 which exceeds the .01 level of significance for 57 degrees of freedom. Thus the difference between means must be recorded as highly significant.

The ninth null hypothesis tested: There is no significant difference between the PPST writing test scores of MSU male and female pre-service teachers. As shown in Table 1, the male writing test scores mean is 5.70 while the female writing test scores mean is 6.19. The difference between the two means is .49 favoring the female pre-service teachers test scores. This difference resulted in a critical ratio (t) of 1.17 which fails to reach the .05 level of significance for 57 degrees of freedom. Thus the difference between means must be marked as not significant.

Study Conclusions

Nine null hypothesis were formulated to answer the general research question and problem of this study: Is there a real difference in the Pre-Professional Skills Tests (PPST) test scores within and between female and

male pre-service teachers at Mankato State University (MSU)? Based upon experimental evidence, four of the nine null hypotheses, numbers one, three, seven, and nine were accepted; on the other hand, five of the nine null hypotheses, numbers two, four, five, six and eight were rejected.

Apparently, some of the long-held beliefs of persons responsible for the conduct of teacher education programs at Mankato State University regarding the mental abilities of female and male pre-service teachers need to be qualified. According to the experimental evidence: (1) The verbal (reading and writing) ability of female pre-service teachers is higher than male pre-service teachers; however, it is not significantly higher. (2) The mathematics ability of male pre-service teachers is significantly higher than female pre-service teachers. (3) The mathematics ability of female pre-service teachers is higher than their reading ability; however, it is not significantly higher. (4) The writing ability of female pre-service teachers is higher than their mathematics ability; however, it is not significantly higher. (5) The writing ability of female pre-service teachers is significantly higher than their reading ability. (6) The mathematics ability of male pre-service teachers is significantly higher than their verbal (reading and writing) ability. (7) The writing ability of male pre-service teachers is significantly higher than their reading ability.

In closing, a word of caution about this study. Although its findings and conclusions are based upon experimental evidence, they could simply be a function of the recruitment policies of the institution. For example, the verbal ability of female pre-service teachers could be significantly higher than male pre-service teachers at other colleges and universities. In any event, the findings and conclusions of this study must not only be submitted to the test of experimental evidence again at Mankato State University but

at other institutions of higher education before any valid set of generalizations can be drawn regarding the mental abilities of female and male pre-service teachers, per se.

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